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Authors:

Fernando Furquim

Kristen M. Glasener

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A Quest for Equity? Measuring the Effect of QuestBridge on Economic Diversity at Selective Institutions

Fernando Furquim[1] · **Kristen M. Glasener**[1]

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Abstract In response to growing income stratification in higher education, President Obama convened a White House Summit in 2014 where over 100 selective institutions committed to increasing the number of low-income students on their campus. One way colleges proposed to do so is through partnerships with college access organizations like QuestBridge, a nonprofit organization that aims to increase the percentage of low-income students at elite universities. While institutions purport that QuestBridge improved socioeconomic diversity, empirical research has not confirmed these claims. In this study, we estimate the effect of QuestBridge on overall access of Pell eligible students at partner institutions using quasi-experimental methods. We find no increase in the economic diversity of colleges after establishing a partnership with QuestBridge, except for colleges simultaneously partnering with QuestBridge and enacting no-loan financial aid policies. We also consider whether participation in QuestBridge increases institutional status through larger application volumes and increased selectivity, and discuss implications for research and practice in the area of stratification.

Keywords Admissions · Difference-in-differences · Stratification · Access · Selective colleges · Elite institutions

✉ Fernando Furquim
Ffurquim@umich.edu

Kristen M. Glasener
glasener@umich.edu

[1] Center for the Study of Higher and Postsecondary Education, University of Michigan, 610 East University Avenue, Ann Arbor, MI 48109, USA

Introduction

College enrollment has grown dramatically in the United States over the past three decades, with more than 21 million students enrolled in degree-granting institutions in 2010 (Perna and Kurban 2013). However, college enrollment rates vary considerably based on race, ethnicity, and family income. Students from low socioeconomic backgrounds are concentrated at lower-cost and under-resourced two-year community colleges and for-profit institutions, while students from affluent families are overrepresented at selective institutions. Enrollment disparities are particularly acute at the most competitive four-year institutions, where affluent students outnumber students of low socioeconomic status (SES) by 14 to 1 (Carnevale and Strohl 2013). Even after controlling for variations in academic ability, achievement, and expectations, students from lower-SES backgrounds are less likely than similar students from privileged backgrounds to attend selective institutions (Astin and Oseguera 2004).

In response to growing income stratification in higher education, President Obama convened a national White House Summit in December 2014 where more than 100 selective institutions committed to increasing the number of low-income students on their campus (The White House 2014a). One way colleges proposed to do so is through partnerships with college access organizations that assist low-income students in the college admissions process. Precollege programs are frequently recognized as an important mechanism for improving access to selective institutions for low-SES students (Swail and Perna 2002). Sponsored by federal and state governments, colleges and universities, and nonprofit organizations, precollege outreach programs focus on improving college readiness for historically underrepresented groups by providing financial support, academic preparation, and knowledge about college (Perna et al. 2008). Despite significant federal and private investment, little is known about the outcomes and effectiveness of these programs. Research suggests that precollege programs may promote college readiness and reduce students' need for remediation (Cunningham et al. 2003; Fensky et al. 1997). However, there have been few rigorous evaluations of the effectiveness of college access programs.

Nevertheless, many colleges and universities cited partnerships with college access programs to support their outreach and recruitment efforts of low-income students at the White House Summit. Five prominent institutions (Amherst College, Pomona College, Oberlin College, Wesleyan University, and Yale University) specifically committed to expanding on their current outreach efforts though existing partnerships with the college access organization known as QuestBridge (The White House 2014b). The goal of QuestBridge is to increase the percentage of talented low-income students attending highly selective colleges and universities. QuestBridge partners with 36 elite colleges and universities (see Table 1). Since 2004, the organization has expanded rapidly, adding an average of three new partners each year. QuestBridge creates a unique application that incorporates information on students' financial background, and institutions award full four-year scholarships to successful applicants ("About Questbridge," n.d.). Yet, like many other college access programs, QuestBridge has never been rigorously evaluated.

There is increasing concern among educational leaders and policymakers regarding the need for better evidence to determine which educational outreach programs do or do not work (Reynolds and DesJardins, 2009). The U.S. Department of Education's Institute of Education Sciences (IES) established the "What Works Clearinghouse" in 2002 to promote the rigorous evaluation of educational programs using experimental and quasi-experimental research design (Schneider et al. 2007). This paper provides a crucial step

Table 1 QuestBridge partner institutions (n = 36)

Amherst College, MA	Rice University, TX
Bowdoin College, ME	Scripps College, CA
Brown University, RI	Stanford University, CA
California Institute of Technology, CA	Swarthmore College, PA
Carleton College, MN	Trinity College
Colby College, ME[a]	Tufts University, MA
Colorado College, CO	University of Chicago, IL
Columbia University in the City of New York, NY	University of Notre Dame, IN
Dartmouth College, NH	University of Pennsylvania, PA
Davidson College, NC	University of Southern California, CA
Emory University, GA	University of Virginia, VA[b]
Grinnell College, IW	Vanderbilt University, TN
Haverford College	Vassar College, NY
Massachusetts Institute of Technology, MA	Washington and Lee University, VA
Northwestern University, IL	Wellesley College, MA
Oberlin College, OH	Wesleyan University, CT
Pomona College, CA	Williams College, MA
Princeton University, NJ	Yale University, CT

[a] Colby College excluded from analysis due to the fact that partnership began in Fall 2015

[b] Denotes public institutions excluded from analysis

toward determining the effectiveness of such college access programs, as it is the first of its kind to evaluate QuestBridge. We explore the effect of the QuestBridge program on the enrollment of low-income students at highly selective institutions using institutional data and a quasi-experimental design (conditional difference-in-differences).

Specifically, we estimate the effect of QuestBridge on the number and proportion of Pell grant recipients attending partner institutions using difference-in-differences on samples of highly selective colleges and by using coarsened exact matching (CEM). The non-parametric matching approach combined with difference-in-differences improves the quality of non-experimental evaluation results significantly (Blundell and Costa Dias 2000). We also consider whether participation in QuestBridge benefits partner institutions in other ways; namely, by increasing institutional status through larger application volumes and increased selectivity. In so doing, we are able to determine whether QuestBridge achieves its stated goal of increasing access for low-income students, which has important implications for income stratification in higher education. Our findings reveal no increase in the economic diversity of colleges after establishing a partnership with QuestBridge. This finding has implications for institutional efforts to improve diversity, and to the expansion of QuestBridge to additional colleges and universities.

Background

The QuestBridge Program

QuestBridge aims to “increase the percentage of talented low-income students attending the nation’s best universities” as a response to growing income stratification and undermatching trends in elite institutions (“About Questbridge”, n.d.). The QuestBridge

National College Match program enables low-income students to submit college applications early via a customized application portal at no cost to a maximum of eight institutions, ranked in order of student preference (among its 36 member participants). The QuestBridge application includes detailed information about the students' financial background, two essays, short answer questions, and extracurricular information, as well as two letters of recommendation, high school transcript, and standardized test scores. Students are evaluated on their academic achievement, financial qualifications, and personal circumstances. Applicants who are selected as QuestBridge Finalists are considered for admission with full four-year scholarships through a proprietary matching process. Applicants who do not match with a partner institution in their ranked list through QuestBridge are eligible to participate in QuestBridge regular decision, at which point the cap of eight institutions is lifted (enabling students to apply to an additional 28 institutions). Although QuestBridge does not enforce particular income cutoffs for participating students, College Match Finalists typically come from households earning less than $60,000 annually for a family of four ("About QuestBridge, n.d."). In 2015, the median income of QuestBridge Finalists was $33,177 and 89% of Finalists qualified for free or reduced price lunch in high school.

Since 2004, more than 60,000 students have submitted applications to QuestBridge and nearly half have been selected as QuestBridge Finalists. Once students are selected as Finalists, they can apply to as many as eight partner colleges. However, the College Match process is highly competitive. On average, only 10% of Finalists match with partner institutions and receive a full four-year scholarship, while approximately 37% are admitted via regular decision ("About Questbridge," n.d.). To date, no studies have examined whether QuestBridge contributes to the overall economic diversity of partner colleges. One might also question whether participation in QuestBridge leads to benefits to the institution that are counterproductive to the goal of economic diversity: increased application numbers and higher selectivity rates (Table 2).

Institutional Stratification in Postsecondary Education

A vast amount of research seeks to understand the stratification of students in higher education by socioeconomic status. This research demonstrates that the system of higher education in the United States is highly stratified by mission, selectivity, and returns to degree—a phenomenon known as institutional stratification (Bastedo and Gumport 2003). There are large variations in the distribution of academic and financial resources among colleges and universities. Resource-rich institutions use their extensive economic resources to support more educational spending while keeping students' net tuition prices low (Winston 1999). These well-resourced institutions offer a broad range of academic and financial resources benefiting their students. Students tend to be attracted to such institutions, which in turn leads to greater selectivity and institutional prestige (Winston 1999, 2004). Combined, institutional resources, selectivity, and prestige serve as sorting criteria within the postsecondary sector. These stratifying patterns create considerable differences by social class not only in terms of whether students go to college, but also where they attend (Winston 2004).

Patterns of Stratification at Selective Institutions

Although the majority of research on college access focuses on who goes to college, a number of studies have examined patterns of enrollment across levels of institutional

Table 2 QuestBridge membership and applications *Source* Questbridge.org/acceptance-rates and IPEDS

	2006	2007	2008	2009	2010	2011	2012	2013
Number of QB partner institutions	13	18	24	26	29	30	33	35
Number of QB applicants	3345	3715	4889	5830	6647	7821	9585	12,818
Number of QB finalists	1594	1794	2470	2506	2748	3850	4518	4773
Number of Match Scholarships	103	204	260	268	310	321	383	440
Total number of applications at partner institutions	114,234	185,898	271,293	322,268	408,507	438,448	498,734	550,815
QB applicants as a percentage of total applications at partner institutions*	2.9%	2.0%	1.8%	1.8%	1.6%	1.8%	1.9%	2.3%

* The total number of QB applications submitted is not reported by the organization. Therefore, this row represents the proportion of QB applications at partner institutions assuming a single application per QB applicant. This is a conservative estimate of the reach of QuestBridge, as applicants may submit applications to eight partner institutions during the college match process, plus any number of additional applications for regular admissions

selectivity. Carnevale and Rose (2004) found that 74% of the students at the top 146 schools in the nation came from families in the top quarter of the SES distribution, with only roughly 10% coming from the bottom half of the distribution (as measured by the composite index in High School & Beyond and the National Education Longitudinal Study of 1988). Disparities in enrollment by selectivity level have persisted over time. Bastedo and Jaquette (2011) found that the proportion of low-SES students in selective institutions remained relatively constant from 1972 to 2004 even as these same students made gains in academic performance, suggesting that access to selective institutions for low-income students has not expanded over time.

A number of studies have sought to explain why low-income students are underrepresented at selective colleges. Some scholars point to the increasing competition for access to selective institutions as one explanation for institutional stratification. Bastedo and Jaquette (2011) assert that as the number of students seeking access to selective institutions has increased, so too has the competition between schools to attract the best students. They found that, although low-income students have shown strong gains in the indicators that lead to admission at highly selective schools, such as SAT scores and high school GPA, higher-income students have simultaneously made even stronger gains on the same indicators. As a result, they concluded that selective college enrollment has become "a horse race in which wealthier students always remain at the head of the pack" (p. 319).

Other scholars have focused on the pipeline of qualified low-SES students, contending that low-income students may not have the cultural or academic capital to consider applying to selective colleges (St. John et al. 2010) or that there are simply too few low-SES students who are qualified for admission at selective institutions (Bowen and Bok 1998). Even when low-SES students do meet the qualifications for admission, they may not apply due to perceived price barriers (Bowen et al. 2009; Dynarski 1999). The "sticker

shock" associated with high tuition is particularly salient for low-SES students (McPherson and Schapiro 1991). A more recent empirical study of institutional financial aid policies demonstrated that the elimination of loans from low-income students' financial aid packages positively affected enrollment rates (Hillman 2013). Combined, these findings suggest that high tuition may deter low-income students from considering highly selective institutions, but targeted financial aid policies can be an effective tool for promoting low-income students' enrollment.

A final area of research centers on "undermatching" as a major cause of institutional stratification (Bowen et al. 2009; Avery and Hoxby 2012). Undermatch scholars argue that the root cause of stratification is not a low supply of low-income students, but rather that high-achieving low-income students do not apply to selective colleges or universities (Avery and Hoxby 2012). The "undermatching" hypothesis suggests that there is a significant pool of low-income students who attend less selective colleges than their academic qualifications enable them to (Bastedo and Flaster 2014). A number of empirical studies have found large differences in college application rates between low- and high-income students, even after controlling for relevant college-choice factors (Carnevale and Rose 2004; Hill and Winston 2006). Using data from 28 of the most selective private four-year institutions in the United States, Hill and Winston (2006) found that only 10% of students enrolled in elite private schools came from the bottom 40% of the national income distribution. The authors concluded that elite colleges could enroll more low-income students without reducing the average ACT or SAT scores of incoming cohorts. Hill and Winston (2010) also found that traditional student recruitment practices at elite institutions focus on parts of the country with small numbers of high-ability, low-income students. In a randomized controlled study, Hoxby and Turner (2013) demonstrated that targeted, customized information about college choice and the college application process increased the rate of applications and enrollment of high-achieving, low-income students to selective colleges. These studies suggest that elite colleges could expand access for low-income students by revising their admissions and financial aid policies with no tradeoff on the academic ability of incoming students, and thus no sacrifice to institutional selectivity or prestige.

Conceptual Framework

The QuestBridge program could increase the number of low-income students at elite colleges and universities by influencing student or institutional behavior at different points in the college enrollment process. We begin with a conceptual framework that explores how QuestBridge may affect the behavior of college applicants. Second, we consider how partner institutions may respond to these changes. To do so, we draw from three theoretical frameworks. We start with a discussion of the college choice model, and how QuestBridge may influence students at different stages of that process. We then draw on theories of prestige maximization and latent functions to understand why institutions seek to partner with QuestBridge, and how institutional processes may reinforce or run counter to the goals of the program.

College Choice Model

We consider the conceptual model of college choice to understand how QuestBridge influences the admission and enrollment behavior of low-income students. Traditional college choice models describe the stages necessary for college enrollment, beginning with

an individual's predispositions toward attending college, followed by a search stage in which information is gathered about specific institutional opportunities, and concluding with a choice stage during which individuals apply and decide where to enroll (Hossler and Gallagher 1987). Extensions of this model consider the economic, sociocultural factors, and institutional factors (institutional selectivity, costs, recruitment, financial aid) that may facilitate or inhibit college enrollment, particularly for low-income students and Black and Hispanic students (Perna 2006).

QuestBridge may achieve its goal of increasing the percentage of low-income students at selective institutions by removing barriers during both the search and choice stages of the college choice process, when students accumulate the information necessary to develop a short list of institutions to which to apply, submit college applications, and make enrollment decisions (Cabrera and La Nasa 2000). QuestBridge may enable low-income applicants to apply to institutions they otherwise would not have by reducing students' choice set to a select number of elite institutions from its 36 partner institutions, thus simplifying the search process. In addition, QuestBridge reduces the effort required to submit applications through its customized application portal, allowing students to bypass multiple, different application processes at partner institutions. By simplifying the application process and enabling low-income students to apply to multiple institutions simultaneously free of charge, QuestBridge removes application barriers, which has been shown to benefit low-income students. Pallais (2015) found that low-income students respond especially strongly to reductions of application barriers, using additional free submissions of ACT scores as a policy change that contributed to increases in the number of applications submitted by low-income students. Furthermore, QuestBridge may influence students' choice stage by providing full four-year scholarships to Finalists who match at partner institutions, which should be particularly appealing to price-sensitive low-income students (Hill et al. 2005; McPherson and Schapiro 1991).

QuestBridge Mechanisms

Within the conceptual framework discussed above, we identify three potential mechanisms through which QuestBridge may contribute to campus economic diversity. QuestBridge targets the search and choice stages of the model. We can define the proportion of low-income students attending an institution as resulting from the application pipeline, institutional admissions decisions, and student enrollment decisions. This relationship can be described by the identity:

$$\frac{Enroll_{low\,income}}{Enroll_{total}} = \frac{\left(\frac{Apps_{low\,income}}{Apps_{total}}\right) * Admitrate_{low\,income} * Yield_{low\,income} * Apps_{total}}{Enroll_{total}} \tag{1}$$

Though the equation could be reduced further, this form makes clear the three mechanisms through which QuestBridge may contribute to campus economic diversity. We can describe the mechanisms in terms of partial derivatives—allowing one parameter to vary while holding all others fixed. QuestBridge seeks to partner with highly selective institutions that have a vested interest in maintaining institutional resources and prestige (Winston 1999). The maintenance and growth of institutional prestige, discussed in detail in the next section, is a constraint on which parameters institutions may vary to achieve greater economic diversity. As a result, though the equation above implies it is possible to increase the proportion of low-income students by making changes to total enrollment or overall admissions rates, these strategies are inconsistent with the maintenance of

institutional prestige and thus ruled out. This leaves three remaining channels available for QuestBridge to pursue its mission: (1) changing the mix of applications so there is greater representation of low-income applicants to partner institutions; (2) increasing the acceptance rate for low-income applicants at partner institutions; or (3) increasing the yield rate for low-income applicants so that more of these students enroll at partner institutions.

The first mechanism implies that QuestBridge enables low-income applicants to apply to institutions they otherwise would not have. By removing barriers during both the search and choice stages of the college choice process, QuestBridge may increase the ratio of low-income applicants to all applicants at partner institutions, leading to a higher proportion of low-income students, holding all else constant. Second, QuestBridge partner institutions may purposefully increase the acceptance rate of low-income applicants as part of their stated commitment to economic diversity. Because QuestBridge aims to recruit high-ability students for participation in its program, the partnership may attract more highly qualified low-income applicants to partner institutions. Thus, the acceptance rate of low-income students may also be higher because of higher applicant qualifications.

However, in order to maintain institutional prestige, this would need to be balanced by a decrease in the acceptance rate of higher-income students, or a decrease in the acceptance rate of low-income students applying through the regular admissions process (assuming relatively fixed total enrollment). The institutional costs associated with financial support for low-income students are significant. In addition to the costs associated with QuestBridge scholars, most participating institutions have other initiatives in place targeted at low-income students, such as no-loan policies (27 of the 36 QuestBridge partners have such policies). In the absence of additional resources, it is possible that institutions may in effect substitute the acceptance of regular, low-income applicants in favor of QuestBridge applicants. Under full substitution, this would result in no effect of QuestBridge on economic diversity, though institutions may experience gains under partial substitution. Ehrenberg et al. (2006) observed such a substitution effect in the tradeoff between institutional funding of National Merit Scholars to the detriment of aid to Pell grant recipients.

Finally, it is possible that QuestBridge increases the probability of admitted low-income students enrolling in partner institutions during the choice stage, thus increasing the yield rate. This is likely the case for matched QuestBridge Scholars, as the match is binding and accompanied by a full scholarship. It is also possible that QuestBridge applicants admitted by regular decision yield at a higher rate because they apply much earlier than regular applicants, which is associated with higher yield (Avery and Levin 2010). It is important to note that an increase in yield of low-income students (holding all else constant) is a potentially problematic mechanism. Specifically, if the effect of QuestBridge on economic diversity is due to changes in yield rates without an attendant increase in the number of low-income applicants admitted, the overall effect among highly selective institutions may be merely a shift in the distribution of low-income students toward QuestBridge partners and away from similarly selective colleges. In such a scenario, there would be no increase in the absolute number of low-income students attending selective colleges, and thus no reduction in overall stratification.

It is important to note that empirically, we only observe the left side of Eq. 1. Universities do not make public the details and demographics of their application pipeline or admissions decisions. One study that did have access to all of the measures in Eq. 1 was an evaluation of Harvard's Financial Aid Initiative (Avery et al. 2006). The authors show that the initiative had a positive and significant effect on the number of applications from low-income students compared to higher income students. There were no differences in the admissions or yield rates for the low-income group. However, the change in the proportion

of low-income applicants was sufficient to result in a higher rate of low-income students among those who enrolled.

Prestige Maximization

Although the primary goal of QuestBridge is to expand access at selective institutions for low-income students, it may also inadvertently increase institutional selectivity and status. That is, partnering with QuestBridge may result in an influx of additional applications from students who may otherwise have not applied. Research on selective admissions suggests that postsecondary institutions are not passive in the education market. Rather, they pursue their own goals in part through the selection of potential enrollees (Grodsky 2007). Colleges often engage in impression management to maximize their prospects of maintaining or increasing their standing in the general public (Clark 1970). Winston (1999) expands on this concept, suggesting that higher education is an industry in which the vital input of prestige can be bought only from its customers, students. Institutions pursue prestige by competing for students with the highest pre-collegiate academic achievement. In so doing, a "feedback is created through which student quality tends to be concentrated in those schools with significant resources," which in turn, increases institutional prestige (Hearn and Rosinger 2014; Winston 1999, 2000). Thus, the QuestBridge partnership may also serve to increase institutional standing at partner colleges and universities by generating additional applications, and lowering the acceptance rate, than would otherwise occur.

We consider two possible mechanisms through which institutions derive prestige from QuestBridge. Merton's concepts of manifest and latent functions could help explain the motivation of QuestBridge partner institutions. Belasco et al. (2014) use this framework to motivate institutions' pursuit of test-optional policies that fail to increase student body diversity, but that do yield gains in applications and selectivity. The additional analysis of latent functions provides an insightful area of sociological inquiry by considering how less overt outcomes enable institutions to maintain their social position (Merton 1957). Even if QuestBridge partner institutions do not achieve their manifest goal of increasing economic diversity, they may still be motivated to partner with the organization because it fulfills a desirable latent function. If this latent function has the effect of reaffirming the position of selective institutions, it may reinforce stratification if, as evidence suggests, there is some tradeoff between the pursuits of prestige and economic diversity (Bourdieu 1993; Bourdieu and Wacquant 1992; Belasco et al. 2014). This analysis examines the possibility that, although QuestBridge aims to expand educational opportunity to low-income students, it may instead result in better institutional position and selectivity at the expense of increased access.

A related mechanism is mimetic isomorphism, defined as the tendency of institutions to mimic their more successful peers in search of status (Morphew and Huisman 2002). Institutions may view a partnership with QuestBridge as a signifier of selectivity and prestige, irrespective of how successful the partnership is in serving its stated goal. Indeed, even if there is no evidence of direct institutional benefit (as found in Belasco et al. 2014), a QuestBridge partnership may be sought purely for the institutional interest in being affiliated with an elite organization and set of peers. These two approaches allow us to consider the overt and less overt intentions of an organization or institution by examining the intended and unintended functions of behavior and how these functions may reinforce current social structures and inequalities (Belasco et al. 2014; Merton 1936, 1957).

Research Objective

Our objective is to capture the causal effect of partnering with QuestBridge on the partner institution's manifest function (increased economic diversity) and latent functions (gains in institutional prestige). QuestBridge aims to remove barriers to facilitate more applications to and enrollment of low-income students at partner institutions. Yet, partner colleges maintain the authority to determine their admissions protocols, which may not favor low-income students who apply via QuestBridge or through the regular application process. We thus address three research questions:

Research Question 1: Is there an increase in the number or proportion of low-income students at institutions post-implementation of QuestBridge?
Research Question 2: Do institutions experience a rise in the number of applications after partnering with QuestBridge?
Research Question 3: Do the admissions rates of QuestBridge partners decline after the partnership?

These three research questions allow us to measure the success of QuestBridge in attaining its (manifest) stated goal of expanding access, and to capture any increases in institutional prestige as reflected by higher application volumes and higher selectivity. These common proxies for prestige reflect underlying demand for a particular institution, and are frequently used by college ranking guides as measures of institutional quality (Bowman and Bastedo 2009).

Analytic Approach

Data

In this study, we build a panel dataset at the institution-year level, spanning 2000–2013. The three sources for this panel are the Integrated Postsecondary Education Data System (IPEDS), the survey conducted by the National Association of College and University Business Officers (NACUBO), and the database of no-loan programs maintained by the non-profit organization Finaid.org. The Department of Education makes available via IPEDS data collected through mandatory surveys of Title-IV eligible institutions, including data on applications, selectivity, enrollment, student demographics, costs, financial aid, institutional finances, and expenditures. Because of inconsistencies and limited availability of data on endowments from IPEDS, we instead rely on NACUBO'S annual survey. Though fewer institutions participate in NACUBO's survey than report to IPEDS, the longitudinal consistency of the data is integral to accurate estimations of our models. Further, the vast majority of selective institutions participate in NACUBO's survey. Finally, Finaid.org provides detailed information on no-loan financial aid policies, including participating institutions, date of policy implementation, and eligibility criteria. There are incidences of missing data throughout the dataset; we exploited the panel nature of our data by using linear interpolation where possible. As a sensitive check, we estimated all of our models on both imputed and not imputed variables separately, yielding consistent findings.

Sample

Though we built our dataset on the full set of four-year colleges in the US reporting to IPEDS (n = 2337), we delimit our population for analysis in several ways to ensure an appropriate comparison group and counterfactual to QuestBridge partners. There is no immediately obvious comparison group, so we construct multiple samples as sensitivity checks of the analysis. To achieve this, we first eliminate all public universities from the sample (n = 703). Public institutions differ from their private counterparts in their missions, recruitment strategies, and enrollment management approach. There is only one public university partnered with QuestBridge (University of Virginia), precluding the use of indicator variables to differentiate public from private institutions. Second, we limit our population to colleges and universities of similar selectivity to QuestBridge partners. We construct two samples using the 2008 edition of *Barron's Profile of American Colleges.* The first includes institutions in the top category ("Most Competitive") of *Barron's* (n = 42) and the second includes the top two categories ("Most Competitive" or "Highly Competitive;" n = 114). The Barron's ratings reflect entrance examination requirements and median scores, the high school rank and grade point average of incoming first year students, and the institution's admissions rate (Schmitt 2009). This initial restriction of the sample reduces heterogeneity of institutional selectivity, resources, and missions. In order to improve the balance of covariates for partner and control institutions, we also develop a third sample using coarsened exact matching (CEM, n = 49). CEM specifies the maximum level of imbalance to be tolerated, and maximizes the sample size that delivers the predefined targeted balance (King et al. 2013). The procedure coarsens (or aggregates) each covariate, places observations with equal coarsened values into strata, and weighs control cases within each stratum to equal the number of treated units (King et al. 2013). All institutions are tracked annually from 2000 to 2013. Simple bivariate tests (see Table 3) show that the growth rate over the duration of the panel for all dependent variables was greater for QuestBridge partners than for any of the control groups, suggesting the need for further analysis.

Methods

In order to isolate the effect of partnering with QuestBridge on socioeconomic diversity, volume of applications, and selectivity, we construct a counterfactual to the partnership. Institutions opt to partner with QuestBridge; in the absence of randomized assignment, we employ conditional difference-in-differences (DiD) to account for self-selection.

The DiD estimator evaluates the causal impact of a particular treatment on the treated over time (the average effect on the treated, ATT), by estimating the difference in pre- and post-measurements for treated and control groups. This technique has been used extensively in education research (e.g., Andrews et al. 2010; Belasco et al. 2014; Dynarski 1999; Hillman 2013; among numerous others).

In its simplest form, difference-in-differences is estimated as:

$$\Delta\Delta Y = (Y_{Tt} - Y_{Tt-1}) - (Y_{Ct} - Y_{Ct-1}) \tag{2}$$

The first difference, captured by $(Y_{Tt} - Y_{Tt-1})$, estimates the change between pre- and post-treatment level of for the treated group—in our case, treatment is defined as partnering with QuestBridge. Accordingly, $(Y_{Ct} - Y_{Ct-1})$ estimates the change over time for the control group. The difference-in-differences $(\Delta\Delta Y)$ is the average treatment effect on the

Table 3 Means (and standard deviations) for QuestBridge partners and differences in means for control observations in *Barron's Profile Samples*

	2001			
	QuestBridge (n = 34)	Barron's "Most" competitive (n = 42)	Barron's "Most" and "Highly" competitive (n = 114)	Coarsened exact matching (n = 49)
Independent variables				
Total undergraduate enrollment	3855 (3135)	+8.86	−613	−326
Tuition	$23,840 (2420)	+$462.50	−$2278***	−$618
Log endowment ($1000 per FTE)	$6.15 (0.78)	−$0.85***	−$1.39***	−$0.78***
Log institutional aid (per FTE)	$9.64 (0.17)	−$0.15**	−$0.37***	−$0.21***
Log instructional support (per FTE)	$10.36 (0.67)	−$0.32**	−$0.69***	−$0.34**
Log student services (per FTE)	$8.70 (0.60)	−$0.20	−$0.39***	−$0.14
SAT reading 75th‰	731.82 (29.20)	−33.82***	−58.69***	−38.82***
SAT math 75th‰	731.82 (34.86)	−25.59***	−57.02***	−34.70***
Percent FTFT black	6.27% (2.35%)	−2.28%	−2.45%***	−1.58%**
Percent FTFT Hispanic	6.71% (2.74%)	−2.11%	−2.05%***	−1.66%**
No-loan policy	0.03 (0.17)	−0.03	−0.03*	−0.03
Dependent variables				
Percent receiving Pell	12.00% (0.04%)	+1.22%	+3.07%*	+2.10%
Number of freshman applications	8204 (5969)	−300	−2821**	−1224
Acceptance rate	31.26% (13.64%)	+10.89%**	+25.15%***	+14.72%***

Table 3 continued

	2013			
	QuestBridge (n = 34)	Barron's "Most" competitive (n = 42)	Barron's "Most" and "Highly competitive" (n = 114)	Coarsened exact matching (n = 49)
Independent variables				
Total undergraduate enrollment	4330 (3468)	+182	−465	−658
Tuition	$43,273 (2106)	+$271	−$3067***	−$1478**
Log endowment ($1000 per FTE)	$6.56 (0.80)	−$1.00***	−$1.50***	−$0.83***
Log institutional aid (per FTE)	$10.41 (0.15)	−$0.16***	−$0.35***	−$0.20***
Log instructional support (per FTE)	$10.88 (0.80)	−$0.43**	−$0.83***	−$0.58***
Log student services (per FTE)	$9.29 (0.54)	−$0.31***	−$0.47***	−$0.29***
SAT reading 75th‰	758.95 (25.37)	−33.70***	−70.42***	−41.55***
SAT math 75th‰	764.89 (29.72)	−22.62***	−66.27***	−34.74***
Percent FTFT Black	5.73% (2.13%)	−1.13%**	−1.07%	−0.23%
Percent FTFT Hispanic	10.22% (3.47%)	−1.52%*	−1.20%	−1.10%
No-loan policy	0.79 (0.41)	−0.58***	−0.72***	−0.64***
Dependent variables				
Percent receiving Pell	14.65% (3.68%)	−0.27%	+3.18%**	+1.48%
Number of freshman applications	16,200 (12,262)	−2354	−6000***	−5098**
Acceptance rate	17.96% (8.40%)	+12.22%***	+29.25%***	+18.24%***

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

treated under the assumption that, absent treatment, the expected change in the trend for the treated group equals that of the control group:

$$E(\Delta Y_T | T = 0) = E(\Delta Y_C) \quad (3)$$

This condition is the parallel trends assumption, which must hold in order for DiD to yield an unbiased estimation of ATT. Essentially, this assumption requires that the pre-treatment trend for the dependent variable of both groups be the same. The magnitude of Y_{Tt-1} and Y_{Ct-1} may differ, but their trends must be parallel for the control group to be an appropriate counterfactual. We pursue two strategies to meet the parallel trends assumption. First, we condition the model on a rich set of covariates drawn from our theoretical framework and prior literature. Second, we use samples conditioned on selectivity and coarsened exact matching as a means of preprocessing data to ensure similarity between treatment and control groups, as outlined in Ho et al. (2007). This multiple comparison group approach results in estimates that are less model- or sample-dependent, and reduces the sample without bias, ensuring greater balance of the explanatory variables and greater independence between treatment and control variables.

Once the samples have been preprocessed, we condition the DiD estimation on a robust set of control variables that are likely to influence the economic diversity and admission profile of a selective institution. These variables were selected in accordance with our conceptual framework and existing literature on determinants of each dependent variable. They reflect institutional resources, cost, student body characteristics, and selectivity, and capture important dimensions of postsecondary options that prior research has established matter to students during the college choice process (e.g., Long 2004). Because these variables determine students' postsecondary choices, they are inextricably linked to the outcome variables in this analysis.

Measures of institutional resources include endowment size and expenditures on academic support, instruction, and institutional aid, which capture the ability and commitment of an institution to support low-income students. Because of the range of enrollment size of universities in the dataset, endowment and expenditure variables are in logged dollars per student (using full-time enrollment). Cost is measured by (logged) annual published tuition charges for full-time attendance. Tuition is an important determinant of students' application and enrollment choices, and factors into the determination of financial need of a student. Student body characteristics include size (logged full-time enrollment), demographics (percentage of full-time, first-time students of Black or Hispanic ethnicity), and academic ability (75th‰ SAT scores in math and reading of enrolled students, rescaled to 10-point intervals).[1] Finally, because the time frame of the panel coincides with a rise in the prevalence of no-loan policies at selective institutions that have been shown to increase the enrollment of low-income students (Hillman 2013), we include a dichotomous flag for no-loan policies for each institution-year. The specifics of no-loan financial aid policies vary across institutions, but such policies typically involve the elimination of loans from financial aid packages, which are typically replaced with additional grants or work-study awards. Together, these variables capture the aspects of each observation that would be expected to lead to differential time trends for the two groups (Lechner 2011). Table 3 provides descriptive statistics for QuestBridge partners and control institutions. The specific models to be estimated are:

[1] Because of the timing of IPEDS data collection, several variables are lagged for the model of application volume. Lagged variables are identified in Table 4.

$$Y_{it} = \beta_0 + \beta_1(QB\_Partner_i * Post_t) + \beta_2 Control_{it} + \gamma_i + \delta_t + \varepsilon_{it} \quad (4)$$

In Eq. 4, Y_{it} is the relevant dependent variable for institution i at time t for each research question (number and proportion of full-time, first-time Pell recipients for RQ1, number of applications for RQ2, and admission rate for RQ3). $Control_{it}$ is a matrix of covariates for institution i at time t, including institutional resources, student body characteristics, and selectivity. Note that the specific variables used for each model vary slightly; see Tables 4, 5 and 6 for full specification of each model. Further, because of the timing of IPEDS data collection, we lag several variables for RQ2 (application volume); lagged variables are identified in Table 4. The variables γ_i and δ_t represent institution fixed effects (for unobserved time-invariant institutional characteristics) and year fixed effects (for unobserved time variant trends common to all institutions), respectively. They account for unobserved concepts like heterogeneity of institutional missions and admissions policies, and for macro trends that may affect dependent variables, such as overall poverty rates. The main independent variable of interest is β_1, the DiD estimation of the ATT, as the term ($QB\_Partner_i * Post_t$) equals one for QuestBridge partners during the treatment period.

We turn next to issues of functional forms. Two of the dependent variables—the number of Pell recipients and the number of applications received—may be treated as continuous and modeled with ordinary least squares (OLS) techniques. The other two dependent variables—the percentage of students receiving Pell grants and admissions rate—are proportions. Although it is common practice to use OLS regression to analyze proportions (Papke and Wooldrige 1996), doing so gives rise to many of the same problems inherent in linear probability models such as heteroskedasticity, non normality of errors, biased coefficients, nonsensical predicted values, and incorrect statistical inferences (Horace and Oaxaca 2006). These drawbacks are most pronounced outside the relatively linear portion of the sigmoid curve (around 0.3 to 0.7). Alternative approaches include the use of a logit transformation (Baum 2008), the beta distribution (Buis 2002), or the fractional logit (Papke and Wooldrige 1996). We estimate proportions using the latter, because fractional logit models retain proportions with values at the extremes zero and one, and yield easily interpretable coefficients (Baum 2008; Papke and Wooldrige 1996). In our analysis, the fractional logit regressions are estimated using a generalized linear model with a binomial distribution and a logit link function.

Non-linear models are susceptible to the "incidental parameters" problem, which biases estimates in the presence of numerous unit-level fixed effects in a panel dataset, particularly in panels with a small time dimension and a large number of units, as ours is (Papke and Wooldridge 2008). We use fixed effects for the OLS models; for nonlinear models, we follow the work of Papke and Wooldridge (2008), using the Chamberlain-Mundlak device. The Chamberlain-Mundlak device requires computing unit-level averages of independent variables across time, which are then included as regressors in the models. This approach enables us to account for time constant variations in the independent variables, just as institutional fixed effects do, while avoiding the incidental parameters problem.

Limitations

There are important limitations both to our data and empirical strategy. QuestBridge is a fairly young organization, so only a few years of treatment are observed for the limited number of partner organizations. The longest partnerships have been in place for ten years. The scale of QuestBridge, measured by the number of students they serve, may also limit

the effect of the partnership, particularly for larger institutions or those receiving large numbers of applications. Further, we are limited to the use of publicly available data at the institutional level. Institutional data preclude us from making any inferences about the behavior of applicants, who most closely interact with QuestBridge, or from conducting any subgroup analyses. We also rely on approximate measures for certain important concepts. For example, the use of Pell grant eligibility is not sufficiently nuanced, as Pell eligibility is dependent on a specific income cutoff and may ignore other dimensions of economic diversity. Also worth noting, QuestBridge does serve students ineligible for Pell grants based on family income. As such, our estimates may be interpreted as a lower bound of the effect of QuestBridge for RQ1. With respect to RQs 2 and 3, we are restricted to studying only two measures of institutional prestige, and cannot observe more qualitative potential benefits that institutions may accrue, such as positive media coverage.

There are also limitations to the generalizability of findings. Though we attempt to control for the issue of self-selection into a partnership via the use of difference-in-differences, multiple comparison groups, and fixed effects, it is possible that selection effects remain, such that QuestBridge partners constitute a distinct subset of higher education institutions. The DiD identification strategy is limited by the parallel trends assumption, which cannot be directly tested.[2] Of note, DiD yields only an average treatment effect across all units and lengths of partnership, limiting our insight into how institutional characteristics interact with the treatment, or how partnerships may evolve over time.

It is also important to consider the particular idiosyncrasies of QuestBridge itself, and how comparable similar programs may be. Several features of the organization, such as the complex match process and full, four-year scholarship, are unique among college access organizations. Nevertheless, we maintain that our empirical strategy should yield a valuable measure of the effect of QuestBridge on its partner institutions. There is a need for analysis of these types of "boutique" programs, especially in the context of the high profile of these partner institutions, the expansion of QuestBridge partnerships and the high costs borne by partner colleges, and the mounting pressure on colleges and universities to expand access to low-income populations. Findings may also inform the evaluation and strategies of other organizations seeking to address stratification and undermatch.

Results

Table 3 presents descriptive statistics for the treatment group (QuestBridge partners) and the mean differences of the control groups in 2001 and 2013 for each of the three samples. Though the matched sample improves overall balance, some baseline differences remain between treated and control groups for several control variables. Nevertheless, simple bivariate analysis suggests that QuestBridge partners made larger gains over the duration of the panel than control groups in the proportion of Pell students served (2.7% point increase, vs. 1.16–2.7 for the control samples), volume of applications received (97%

[2] We indirectly test the parallel trends assumption graphically and by regressing the dependent variables on (1) an indicator variable for eventual QuestBridge partners, (2) a trend variable, and (3) an interaction of the indicator and trend variables. A significant coefficient on the interacted term would suggest a violation of the parallelism assumption. Results from this analyses (available by request) show that the interaction term is statistically insignificant for all dependent variables, and the point estimate is essentially zero.

Table 4 GLM regression (fractional logit) results for proportion of FTFT students eligible for Pell grant

	Barron's "Most Competitive"	Barron's "Most" and "Highly Competitive"	CEM
QuestBridge	0.050 (0.065)	0.042 (0.060)	0.052 (0.060)
Total enrollment[a]	0.116 (0.245)	−0.238 (0.145)	−0.201 (0.252)
Endowment in $1000 per FTE[a]	0.175 (0.212)	−0.078 (0.071)	−0.013 (0.197)
SAT reading 75th‰	−0.022* (0.013)	−0.003 (0.012)	−0.008 (0.013)
SAT math 75th‰	0.000 (0.018)	−0.014 (0.011)	−0.004 (0.016)
Admissions rate	0.589** (0.290)	0.425*** (0.011)	0.513* (0.296)
Tuition[a]	0.030 (0.538)	−0.039 (0.340)	0.562 (0.465)
Institutional aid per FTE[a]	0.401* (0.241)	0.278** (0.138)	0.377 (0.235)
Institutional support per FTE[a]	0.020 (0.084)	−0.020 (0.068)	−0.010 (0.086)
Instructional svcs per FTE[a]	−0.017 (0.108)	−0.061 (0.095)	−0.000 (0.111)
Student svcs per FTE[a]	−0.009 (0.065)	0.040 (0.053)	−0.000 (0.067)
Percent FTFT Black	1.001 (1.119)	1.657** (0.650)	1.331 (1.027)
Percent FTFT Hispanic	1.703** (0.739)	2.385*** (0.454)	1.834*** (0.637)
No-loan policy	0.116* (0.062)	0.072 (0.054)	0.107* (0.065)
Year fixed effects	Yes	Yes	Yes
Institution-specific averages	Yes	Yes	Yes
N	838	1504	922
BIC	740.58	1168.75	797.29
Pseudo R^2	0.442	0.427	0.410

Standard errors in parentheses, clustered at institution level

[a] Indicates logged variable

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

growth vs. 60–90% for control), and selectivity rates (42% more selective vs. 16–28%). These differences suggest that further analysis on the role of QuestBridge is warranted.

Tables 4 through 7 report results for each of the three research questions. The coefficient of interest is the one associated with the dichotomous variable indicating QuestBridge partnership for each institution in each year in the panel. The tables report results for each of the three samples. All models use standard errors clustered at the institution level. In order to approximate a measure of fit for each model, we calculate a pseudo R^2 by squaring the correlation between predicted and observed values for each outcome. This pseudo R^2 serves as a useful heuristic of model fit, as there is no standard measure of fit for fractional logit models (Cox 2003). The findings are consistent across all three samples.

With respect to the stated goal of these partnerships, Tables 4 and 5 report results of regressions for the proportion and number of full-time, first-time Pell grant recipients, respectively. Table 4 presents coefficients as fractional logit units, from which we compute marginal effects for ease of interpretation; the coefficient on Table 5 can be interpreted as a measure of elasticity, as both sides of the equation are logged. In both models, we find no treatment effect. The average marginal effect of QuestBridge on the proportion of Pell eligible students (Table 8) is 0.6 percentage points, but this effect is not statistically different from zero. Consistent with prior research (Hillman 2013), the coefficient on no-

Table 5 OLS regression results for logged count of FTFT students eligible for Pell grant

	Barron's "Most Competitive"	Barron's "Most" and "Highly Competitive"	CEM
QuestBridge	0.050 (0.058)	0.048 (0.055)	0.051 (0.055)
Total enrollment[a]	0.368 (0.231)	0.294* (0.154)	0.170 (0.221)
Endowment in $1000 per FTE[a]	0.173 (0.157)	0.009 (0.051)	0.048 (0.178)
SAT reading 75th‰	−1.243 (0.748)	−0.456 (0.461)	−0.646 (0.647)
SAT math 75th‰	−0.780 (0.986)	−1.431** (0.572)	−0.859 (0.862)
Admissions rate	0.155 (0.190)	0.219 (0.145)	0.326 (0.265)
Tuition[a]	0.337 (0.460)	0.051 (0.311)	0.255 (0.441)
Institutional aid per FTE[a]	0.222 (0.150)	0.151 (0.092)	0.244 (0.163)
Institutional support per FTE[a]	−0.017 (0.065)	−0.048 (0.059)	−0.064 (0.071)
Instructional svcs per FTE[a]	0.007 (0.088)	0.018 (0.080)	0.058 (0.093)
Student svcs per FTE[a]	0.007 (0.070)	0.022 (0.080)	−0.006 (0.093)
Percent FTFT Black	0.538 (0.900)	0.981 (0.611)	1.041 (0.866)
Percent FTFT Hispanic	1.330** (0.651)	1.666*** (0.422)	1.287** (0.562)
No-loan policy	0.067 (0.056)	0.037 (0.051)	0.055 (0.059)
Year fixed effects	Yes	Yes	Yes
Institutional fixed effects	Yes	Yes	Yes
N	838	1504	922
Adjusted R^2	0.295	0.348	0.299

Standard errors in parentheses, clustered at institution level

[a] Indicates logged variable

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

loan policies is significant and has a marginal effect of around 1 percentage point. With respect to the number of Pell recipients, the effect is 0.5%, indistinguishable from zero.

We also estimate possible latent functions of QuestBridge. Similar to the first model, we find non-significant effects for the volume of applications and the admissions rate of partner institutions. For the number of applications, we estimate that QuestBridge partners receive an additional 1018–1170 applications, but this estimate is imprecise (standard errors range from 650 to 770).

The absence of an effect on application volume is counterintuitive. The QuestBridge program provides students with the opportunity to apply to several colleges at the same time at no cost, so one would expect some uptick in the number of applications submitted. There are a few possible explanations for this lack of an effect. Colleges may already be reaching the population of students served by QuestBridge via preexisting policies, such as the Common Application. The Common Application expanded the number of schools served through the duration of our panel, enabling students to efficiently apply to multiple institutions. Alternatively, there may be other duplicative programs already in place that would diminish the effect of QuestBridge on applications, such as application fee waivers for low-income students. Finally, there is a matter of scale. QuestBridge partners receive, on average, over 16,000 applications annually, though there is a large standard deviation for this number (12,000). QuestBridge itself serves around 13,000 students annually, who choose from a set of 36 institutions (and growing). Given these numbers, it is not surprising that the average effect on applications is statistically non-significant. Unfortunately, we

Table 6 OLS regression results for applications received

	Barron's "Most Competitive"	Barron's "Most" and "Highly Competitive"	CEM
QuestBridge	103.386 (72.874)	117.431 (77.235)	101.752 (65.256)
Total enrollment (logged)	1265.737** 560.740)	318.898 (274.202)	1007.807** (437.292)
Endowment in \$1000 per FTE[a,b]	741.311*** (244.245)	195.892* (114.100)	598.460*** (200.100)
SAT reading 75th‰[b]	−7.994 (14.554)	−4.882 (11.948)	−1.165 (12.252)
SAT math 75th‰[b]	−9.515 (21.784)	21.782 (19.407)	−15.586 (18.096)
Admissions rate[b]	−1400.862** (574.933)	−1029.292*** (363.379)	−975.413*** (365.185)
Tuition[a,b]	−1374.353* (697.508)	−227.878 (632.674)	−1388.449*** (525.749)
Application fee[b]	−1.822 (6.335)	2.168 (4.072)	3.061 (3.752)
Institutional aid per FTE[a,b]	216.473** (82.729)	38.503 (113.485)	204.061** (79.270)
No-loan policy	−50.417 (81.739)	−10.993 (79.958)	8.195 (77.453)
Constant	42.036 (8312.853)	−1686.835 (6644.665)	2638.663 (6509.847)
Year fixed effects	Yes	Yes	Yes
Institution fixed effects	Yes	Yes	Yes
N	833	1495	870
Adjusted R^2	0.544	0.455	0.545

Standard errors in parentheses, clustered at institution level

Applications measured in 10 s

[a] Indicates logged variable

[b] Indicates lagged variables (lag is one year) due to timing of data collection by IPEDS

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

cannot observe the distribution of QuestBridge applications to individual partner colleges, reducing the precision of our estimate of the effect on applications and preventing the identification of any possible heterogeneous effects.

Table 7 reports results for the admissions rate model. With respect to QuestBridge, there is no evidence to suggest that the organization has a significant negative effect on admissions rates. The estimated average marginal effects are essentially zero. All institutions in the sample became more selective over the duration of the panel, as admissions rates dropped by at least 10 percentage points for QuestBridge partners and institutions in the control groups. Though we cannot observe acceptance rates by socioeconomic status, this trend suggests that any student irrespective of income faces lower odds of admissions. In all, we find no evidence that QuestBridge fulfills a desirable latent function for its partners, at least on the two dimensions discussed here. In the absence of an influx of new applications (presumably including high-achieving low-income applicants) or a change in admissions rates, it is unclear through what mechanism QuestBridge could affect the percentage of enrolled low-income students at partner colleges and universities.

Table 7 GLM regression (fractional logit) results for admissions rate

	Barron's "Most Competitive"	Barron's "Most" and "Highly Competitive"	CEM
QuestBridge	−0.035 (0.061)	−0.003 (0.059)	0.005 (0.060)
Total enrollment[a]	0.275 (0.423)	−0.363 (0.248)	−0.332 (0.381)
Endowment in $1000 per FTE[a]	0.246 (0.225)	0.026 (0.081)	−0.009 (0.202)
SAT reading 75th‰	−0.019 (0.015)	−0.033*** (0.013)	−0.015 (0.012)
SAT math 75th‰	−0.026 (0.017)	−0.019 (0.013)	−0.038*** (0.014)
Tuition[a]	0.484 (0.517)	−0.182 (0.383)	−0.725* (0.437)
Applications	−0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
No-loan policy	−0.028 (0.062)	−0.085 (0.060)	−0.051 (0.062)
Year fixed effects	Yes	Yes	Yes
Institution-specific averages	Yes	Yes	Yes
N	901	1622	996
BIC	914.06	1584.07	1004.08
Pseudo R^2	0.691	0.746	0.757

Standard errors in parentheses, clustered at institution level

[a] Indicates logged variable

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Robustness Checks

We perform several robustness checks on the findings. For the models reported on Tables 4 and 7, we estimate ordinary least squares specifications in addition to the fractional logit results reported. The OLS regressions yield consistent, but less precise, results that are available upon request. Further, there is some possible collinearity between QuestBridge partnership and the ethnicity of students. To the extent that ethnicity is associated with higher rates of eligibility for Pell grants, it is possible that the inclusion of variables on the ethnic composition of the student body biases downward the effect of QuestBridge. We find no evidence of multicollinearity based on variance inflation factors; models estimated without the ethnicity variables resulted in consistent findings. In a previous iteration of the paper, we also included results from regressions using propensity score matching as an additional means of controlling for selection. Those results concord exactly with the estimations presented here and are not reported for space considerations, but are available upon request.

Discussion

As class stratification at selective institutions continues to grow, it is essential that elite colleges and universities find ways to encourage applications and enrollment of high-ability low-income students. The literature has clearly established that income stratification is particularly prevalent at highly selective institutions, where low-SES students stand to gain the most in terms of educational benefits and social mobility. Too often, students from low-income families perceive educational opportunities at selective institutions to be out of

reach due to price barriers (Bowen et al. 2009). When students undermatch to less-selective institutions, their academic performance tends to suffer and they may face greater odds of dropping out (Hillman 2013). Given these negative consequences, it is important to identify potential interventions that effectively bring more low-income individuals to selective institutions.

Highly selective colleges are increasingly partnering with college access organizations like QuestBridge to address stratification and undermatch without clear evidence of the effectiveness of such programs. Our findings suggest that QuestBridge has not had a measureable effect on expanding educational opportunity for low-income students. We similarly find that QuestBridge does not have a statistically significant effect on application volume or admissions rate at partner colleges. Despite these non-significant findings, QuestBridge continues to expand its partnership with selective institutions, including the initiation of a new partnership with Colby College in fall of 2015 and three new partnerships in 2016 ("College Partners," n.d.). Given the high costs associated with partnering with QuestBridge, and the relatively small proportion of any partner's application pipeline that is delivered by QuestBridge, it is important for institutions to carefully consider the allocation of limited resources in support of expanded access. Although we find that the average treatment effect across all partner institutions is insignificant with regard to both the manifest and latent functions of QuestBridge, we are unable to estimate the effects of a partnership for specific institutions. Institutions retain a great deal of autonomy on how to treat QuestBridge applicants, and different institutional practices could result in a wide variation of outcomes. Further, we can only observe a narrow measure of economic diversity (Pell-eligible students), and it is plausible that the partnership may result in increases in economic diversity for students just above the Pell eligibility limit.

From the perspective of partner colleges, our findings indicate that elite institutions may not be able to simply rely on partnerships with access organizations to increase economic diversity. Indeed, institutions may need to engage in a variety of complementary initiatives aimed at attracting and enrolling low-income students. With multiple initiatives, institutions run the risk of duplicating efforts. Application fee waivers for low-income students, commonly found at a variety of institutions, is one example of a policy that QuestBridge is partially duplicating, as application costs have already been eliminated for low-income individuals at most colleges of this selectivity. No-loan policies are another example of a policy common to the majority of QuestBridge partners. With the caution that our samples were not built to causally evaluate such policies, it is noteworthy that we find a positive and significant association between the proportion of Pell students and implementation of no-loan policies. This finding is consistent with research by Hillman (2013), who analyzed 69 no-loan institutions and found that such policies increase the number of Pell recipients by around 2–5 percentage points. As of 2013, 27 of the 34 QuestBridge partners in our sample had some form of no-loan policy in place. Unfortunately, because we are unable to determine the exact mechanisms through which QuestBridge may change applicant or institutional behavior, it is not possible to distinguish whether the two initiatives are complementary or duplicative. We approximate an estimation of this by revisiting our model for the proportion of Pell recipients, by including main and interaction effects between QuestBridge and no-loan policies. Table 8 reports the average marginal effect of QuestBridge, no-loan policies, and an interaction of the two on proportion of Pell recipients – results for the number of Pell recipients show the exact same pattern. Across samples, the presence of both initiatives yields consistently positive and statistically significant effects, suggesting potential complementarity between the two programs. Further,

Table 8 Average marginal effects for main and interaction effects of QuestBridge and no-loan policies on the proportion of Pell eligible FTFT students

	Barron's "Most Competitive"		Barron's "Most" and "Highly Competitive"		CEM	
	Main effects only	Main effects + interaction	Main effects only	Main effects + interaction	Main effects only	Main effects + interaction
QuestBridge main effect	0.006	−0.004	0.005	−0.006	0.006	−0.004
No-loan main effect	0.013*	0.005	0.009	0.000	0.012*	0.004
QB*No-loan interaction effect	–	0.019*	–	0.021*	–	0.019*

Average marginal effects calculated holding other variables at observed values

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

the positive and significant effect of no-loan policies becomes insignificant once the interaction term is entered. This finding may be a function of coverage – that is, how many students benefit from each program. While QuestBridge works with a relatively small pool of the total applicants for a university, virtually all of its applicants may be covered at least partially by no-loan policies found in selective, high-resource partner universities (Finaid.org, n.d.). Even QuestBridge applicants that are admitted via the regular admissions cycle, rather than through the match process, stand to benefit. The interaction effect indicates that the combination of QuestBridge and no-loan financial aid packaging is associated with an increase of two percentage points in the proportion of Pell recipients.

Just recently, the creation of the Coalition for Access, Affordability, and Success garnered national attention. The coalition represents more than 80 higher education institutions, and will offer students a free online platform aimed at improving the college admissions process and increasing access to low-income individuals ("Coalition for Access," n.d.). As of 2015, thirty QuestBridge partners (over 80%) have joined the Coalition, offering yet another application portal for low-income students to apply to their institutions. This too may duplicate and attenuate the effect that QuestBridge (or any one intervention) may have on economic diversity. Researchers and administrators should consider the joint impact of the full portfolio of initiatives that campuses pursue to address stratification, in order to accurately identify causal effects and appropriately target resources.

Though QuestBridge remains a relatively small and young organization, we argue that it is imperative to subject these programs to rigorous evaluation. Selective colleges and universities continue to dedicate limited funds to programs and policies that aim to increase economic diversity, and evidence for many of these initiatives is mixed at best. Such evaluations face several challenges, such as small sample sizes and time horizons, lack of data transparency, and a variety of confounding factors. The analytical techniques and data source used in this paper could be used for evaluation of other initiatives and, crucially, combinations of initiatives, providing information to institutional leaders committed to expanding access. As we mentioned earlier, the biggest limitation for evaluating outcomes of similar programs is the availability of data. Much of the empirical work evaluating initiatives like QuestBridge, no-loan policies (Hillman 2013), and test-optional admissions (Belasco et al. 2014), relies on data at the institution level. Access to application level data is essential to disentangle the exact barriers and mechanisms underlying different initiatives, especially if the goal is to minimize duplication of institutional efforts and best allocate limited dollars.

Finally, it is important that selective institutions be more transparent about the extent to which they are able to expand educational opportunity for low-income students. Although it may be true that a handful of resource-rich institutions have the ability to support a larger number of low-income students, many other selective institutions face resource constraints that may not allow for a meaningful expansion of low-income student enrollment. Indeed, enrollment managers at selective institutions increasingly face pressures to not only generate the tuition revenue necessary to support each incoming class, but also to increase the academic profiles of their students in order to maintain or increase their level of prestige. The research by Ehrenberg et al. (2006) demonstrates how this tension can lead institutions to exacerbate stratification by dedicating limited funds to more affluent students with higher test scores, to the detriment of similarly qualified low-income students. Admitting more low-income students is unlikely to serve these prestige-seeking goals among selective colleges. Within this competitive college admissions environment, it is unlikely that

increasing the number or the yield of low-income applicants at specific institutions will lead to increases in economic diversity for the sector as a whole.

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